Rendaku in Japanese

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Masaki Sano

0. In this paper we will examine a rather peculiar phenomenon called rendaku, or "sequential voicing" (SV), which is found in some Japanese compounds and derivatives.[1] Some scholars interested in Japanese phonology have discussed this phenomenon (e.g. Kindaichi (1976), Lyman (1894), Vance (1979)), but I believe Otsu (1980) is the first to give some explicit proposals concerning the predictability of SV. Unfortunately, however, his main concern is only with noun compounds and derivatives. We will therefore investigate SV in other cases as well, including verbal and adjectival compounds, after reviewing Otsu's proposals.[2] Of course, this does not mean that our investigation is exhaustive or conclusive. However, I will try to show that more extensive study of SV leads to a deeper understanding of the nature of SV.

1. Otsu's Argument

SV is a phenomenon characterized as voicing of the initial segment of the second element of certain compounds and derivatives, as is shown by the following examples:[3]

(1) a. /s/ ∿ /z/
take+sao ⟶ takezao

b. /t/ ∿ /d/
gaki+taishoo ⟶ gakidaishoo

c. /ts/ ∿ /z/
matsuba+tsue ⟶ matsubazue

d. /š/ ∿ /ž/
buta+shiru ⟶ butajiru

e. /č/ ~ /ǰ/

yunomi+chawan ⟶ yunomijawan

There seem to be various conditions on the applicability of SV proposed, but of particular interest and importance is what is called 'Lyman's Law'. This law states that in order for SV to take place, the second element should not contain any voiced obstruents. Thus observe the following examples:

(2) a. shina+kaki ⟶ shinagake

b. shina+kazu ⟶ shina{k, *g}azu

(3) a. nama+kashi ⟶ namagashi

b. nama+kajiri ⟶ nama{k, *g}ajiri

(4) a. oo+sora ⟶ oozora a'. oo+kata ⟶ oogata

b. oo+sooji ⟶ oo{s, *z}ooji b'. oo+kaze ⟶ oo{k, *g}aze

In these examples, SV is blocked where the second element contains a voiced obstruent (in an non-initial position). I will return to Lyman's Law later in section 3.

There are two major categories relevant to SV, namely compounds and derivatives. Compounds are formed by conjunction of stems, and derivatives, by addition of affixes to stems:

(5) a. compound: stem+stem

b. derivative: prefix+stem
stem+suffix

Otsu claims that there are at least three subtypes of compounds in Japanese, namely strict compounds, loose compounds, and dvandva or 'copulative compounds'.[4] Strict compounds are those whose meanings are not predictable from the meanings of their parts. Loose compounds are those whose meanings are predict-

able compositionally. Compared to strict compounds, loose ones show relatively productive patterns. As for dvandva, Otsu claims that, although classified as compounds, it is a conjunction of some categories higher than the usual stems, such as $\overline{N}$ or $\overline{\overline{N}}$. He uses N' to indicate this higher category.[5] The meaning of dvandva is "N' and N'", as the English translation of dvandva 'copulative compounds' indicates. (Dvandva is a name used by Sanskrit grammarians.)

As an example of strict compounds, Otsu gives karakami. Karakami means 'a paper sliding door' or 'paper used for such a door'. This meaning is not predictable from the meanings of kara and kami. Although kara means 'Chinese' and kami means 'paper', karakami does not mean 'Chinese paper'. However, Karagami, which differs from karakami only in the appearance of SV, does have a compositional meaning, namely 'Chinese paper'. Thus karagami is an instance of loose compounds showing a productive pattern, as in kyoogami ('paper made in Kyooto'), arabiagami ('paper made in Arabia'), etc. An example of dvandva he gives is yamakawa, which means 'mountains and rivers'. Like karakami (strict compound), yamakawa does not show SV, even though the second element kawa does not contain any voiced obstruents. Therefore, only compounds showing SV are loose compounds. He assumes the following internal structures for these three types of compounds:

(6) a. strict compound: $[_N$#kara(+)kami#$]$[6]
b. loose compound: $[_N$#$[_N$#kara#$][_N$#gami#$]$#$]$
c. dvandva: $[_{N'}$#$[_{N'}$#yama#$][_{N'}$#kawa#$]$#$]$

As for derivatives, he argues that "prefix+stem" undergoes SV, as in oo+sora → oozora. He further notes that derivatives

of the form "stem+suffix" do not show SV. Thus shizuke+sa is realized as shizukesa, not *shizukeza. The internal structures of these derivatives he assumes are as follows:

(7) derivative

a. with prefix: $[_N$#oo#$[_N$#zora#]#]

b. with suffix: $[_N$#$[_A$#shizuke#]#sa#]

Noting that the examples showing SV (e.g. (6b), (7a)) all have the structure $[_N \ldots [_N$#... in common, Otsu formulates the rule SV as follows:

(8) C(onsonant) $\longrightarrow$ [+voiced] / $]_N$ X [# _ Y

where (i) X≠null and

(ii) Y does not contain any voiced obstruents

Condition (ii) embodies Lyman's Law already noted. As for the environment indicated after the slash, the presence of the inner bracket prevents (6a) and (7b) from undergoing SV: (6a) has no internal brackets, and sa in (7b) is not bracketed. N specified for the external bracket prevents (6c) from being affected by the rule. The reason for omitting specification of the syntactic category for the inner bracket is that "...since the syntactic category of the derivatives with prefixes is always the same as the syntactic category of the stem, the above formulation [our (8)--M.S.] is more 'economical'. Recall that the syntactic category of the above of the whole compound should in any way be mentioned." (Otsu (1980: 217)) In our subsequent discussions, however, we will try to reformulate a more 'economical' and general version of SV than that of Otsu's.

2. Expansion of the Domain of the Rule

As noted earlier, Otsu considered only noun compounds and derivatives. In this section We will consider verbal and adjectival compounds.[8]

Let us consider verbal compounds first. Some of them are formed by conjunction of a noun with a verb. Thus observe the following examples:

(9) a. nami+tatsu ⟶ namidatsu
b. awa+tatsu ⟶ awadatsu
c. shuukan+tsukeru ⟶ shuukanzukeru
d. moto+tsuku ⟶ motozuku
e. huyu+komoru ⟶ huyugomoru

The first element of verbal compounds is not limitted to nouns; various elements can be used as such, as in the following:[9]

(10) a. ao+sameru ⟶ aozameru
b. naga+hiku ⟶ nagabiku
c. waka+kaeru ⟶ wakagaeru
d. saki+kakeru/hashiru ⟶ sakigakeru/bashiru

As is obvious, (9) and (10) show SV.

Let us now consider adjectival compounds, whose second element is an adjective. The first element can be a noun, an adjective, or a verb:

(11) (N+A)
a. na+takai ⟶ nadakai
b. hara+kuroi ⟶ haraguroi
c. kyoomi+hukai ⟶ kyoomibukai
d. ushiro+kuroi ⟶ ushiroguroi
e. mi+kireina ⟶ migireina

(V+A)

f. nebari+tsuyoi ⟶ nebarizuyoi

g. toki+katai ⟶ tokigatai

(A+A)

h. ama+suppai ⟶ amazuppai

i. zuru+kashikoi ⟶ zurugashikoi

j. ao+shiroi ⟶ aojiroi

These examples show that SV applies to adjectival compounds as well.

Assuming that verbal/adjectival compounds are of the form (12),

(12) $[_{\{V,A\}}\#\ldots[_{\{V,A\}}\#\ldots\#]\#]$

we can extend the rule (8) as follows to include all types of compounds we have considered thus far:

(13) $C \longrightarrow$ [+voiced] / $[_{\{N,V,A\}}$ X [# _ Y

where (i) X≠null and

(ii) Y does not contain any voiced obstruents

Note that Lyman's Law is responsible for non-occurrence of SV in verbal and adjectival compounds as well, when the second element contains a voiced obstruent, as shown by the following:

(14) a. kushi$\{k, *g\}$ezuru

b. mawari$\{k, *g\}$udoi

(14a) is a verbal compound, and (14b), an adjectival compound.

Some careful examination will be necessary in the case of what are apparently verbal compounds. Japanese has a very productive way to form a (complex) verb by confoining some element--typically a noun which denotes some action or state--with a verbal su(ru).[10] Some examples are given below:

(15) a. benkyoosuru
b. hikkoshisuru
c. sotsugyoosuru
d. uttorisuru
e. boNyarisuru

Verbs of this form, [X-s(u)], never show SV, although su(ru) does not contain any voiced obstruents.[11] Note that we have another use of su(ru), which functions as independent verb in that it takes a noun, with a particle o, as an object. This use of su(ru) is exemplified by (16a) below, in contrast to (16b):

(16) a. Taroo-wa benkyoo-o suru.
b. Taroo-wa benkyoosuru.

Notice in passing that a direct object can be added to (16b) but not to (16a):

(17) a. *Taroo-wa eigo-o benkyoo-o suru.
b. Taroo-wa eigo-o benkyoosuru.

I claim that s(u) in [X-s(u)] is bound to X, in that this s(u) is not an independent verb but requires some X attached to it to form a single, though "complex", lexical item. Vance (1979) argues that words with bound morphemes as second elements should not be considered compounds. If he is correct, this

means that verbs of the form [X-s(u)] are not compounds. Presumably this s(u) is a (verbal) suffix. If so, then we do not expect the rule SV to apply to it, since, as Otsu argues, suffixes never undergo SV. Thus, under the assumption that verbs of this type have the following lexical structure,

(18) $[_V$#X+s(u)#]

they are not subject to SV, as desired.

Additional note should be taken of verbal compounds. So far we have considered only those verbal compounds whose first element is other than a verb. Now consider the following examples, which are presumably analyzed as verbal compounds with verbs as the first elements, namely those of the form V+V:

(19) a. kiri+taosu ⟶ kiri$\begin{Bmatrix} t \\ *d \end{Bmatrix}$aosu

b. kiri+tsumeru ⟶ kiri$\begin{Bmatrix} ts \\ *z \end{Bmatrix}$umeru

c. huki+kesu ⟶ huki$\begin{Bmatrix} k \\ *g \end{Bmatrix}$esu

d. tobi+koeru ⟶ tobi$\begin{Bmatrix} k \\ *g \end{Bmatrix}$oeru

None of the second elements in (19) show SV, although they contain no voiced obstruents. There seem to be two possible ways to handle these cases. First, we might add a further condition on SV to the effect that X in (13) should not be a verb if the external bracket is labeled V. When the whole compound is not a verb but a noun or an adjective, it seems that the first element can be a verb. In addition to the (f) and (g) examples in (11), which are of the form V+A, we have the following examples, which may be analyzed as V+N:

(20) a. nagare+hoshi ⟶ nagareboshi

b. nomi+kusuri ⟶ nomigusuri

c. hataraki+hachi ⟶ hatarakibachi

d. hari+kami ⟶ harigami

Thus it seems that the restriction against a verb as the first element holds only for verbal compounds.

Another possibility is to say that verbal compounds of this kind are not instances of loose compounds in Otsu's sense but instances similar to dvandva (cf. (6c)). It does not seem unreasonable to claim that the meaning of tobi-koeru, for example, is 'jump and cross over'. Thus we could give the examples in (19) the internal structure of the form $[_{V'}\#[_{V}\#...\#][_{V}\#...\#]\#]$, where V' is some verbal category "higher" than V. SV formulated as (13) cannot apply to this structure, just as it does not apply to the structure (6c). Without a detailed study of verbal compounds and their internal structure, however, we cannot decide which alternative to choose. (Still another possibility is suggested in note 23, under a different framework which is presented in section 5.)

3. On Lyman's Law

Lyman's Law, as we have seen, conditions the applicability of SV. Counterexamples to this law seem to be hard to find. One possible candidate would be the following example:

(21) nawa+hashigo ⟶ nawabashigo

Vance (1979) claims that this is an counterexample to the law and that the second element hashigo always shows SV in compounds. Notice, however, that hashigo is actually pronounced [haši̯o] and not [hašigo]. [ŋ], as distinct from [g], is not

a voiced obstruent but a nasal, one member of sonorants. It is well-known that Japanese has a rule like the following:

(22) g ⟶ [+nasal] / V _ V[10]

(Note incidentally that Japanese does not have a phonemic consonant /ŋ/.) If we want to maintain Lyman's Law, therefore, SV must take place after (22) has applied to change /hasigo/ to [haši**ŋ**o].[13] However, it is obvious that in the following example SV must take place before (22):

(23) tonosama+kaeru ⟶ tonosamagaeru ⟶ tonosama**ŋ**aeru
SV (22)

We could handke this apparent ordering paradox by saying that both SV and (22) apply cyclically and SV is ordered (extrinsically) before (22). Thus, in $[_{N_1}[_{N}$nawa$][_{N_2}$ hasigo$]]$, (22) applies on the N_2 cycle to change /g/ to [ŋ], and then on the higher cycle N_1, SV applies to change /h/ to [b].[14] In cases like (23), both SV and (22) apply in the order given on the same (topmost) cycle.

Although the account just given is not implausible, we propose to adopt a "filter" version of Lyman's Law. This is a constraint on the phonetic output of the Japanese morphological element:

(24) No morphological element (or morpheme) may contain more than one voiced obstruent.

Some explication will be necessary to clarify the intention of (24). Note first that the real effect of SV is to change a voiceless obstruent, such as t, k, s, to a corresponding voiced one.[15] Thus if SV applied to the second element of compounds

which contains a voiced obstruent in non-initial position, the resulting second element would contain more than one voiced obstruent, unless rules such as (22) operate to decrease the number of voiced obstruents. Such a derivation is filtered out by (24) operating on the phonetic level.[16]

The term "morpheme" mentioned in (24) is admittedly vague and lacks explicitness. I can say no more than that it is the "smallest meaningful unit", following tradition. We have many Sino-Japanese words which contain more than one voiced obstruent, but it seems that they all involve two or more "morphemes"; no single "morpheme" seems to contain more than one voiced obstruent. Cf. bijin (美人), zetsudai (絶大), etc. Similarly, no wago or native words with a single morpheme seem to have more than one obstruent, in general.[17]

If some version of (24) is justified, then we can dispense with the second condition mentioned in (13). Thus any second element of compounds may undergo SV, subject to something like (24).[18]

4. Morphology and SV

In section 2, we saw that SV takes place in the second element of virtually all kinds of compounds--noun, verbal, and adjectival compounds. Let us review types of examples in which SV takes place: (Word boundaries are omitted.)

(25) a. $[_N\ X\ [_N\ \_\ Y\ ]]$
b. $[_V\ X\ [_V\ \_\ Y\ ]]$
c. $[_A\ X\ [_A\ \_\ Y\ ]]$

We observe that the syntactic category of the second element is identical to that of the whole compound. In fact, it seems

that the category of the second element "determines" that of the whole compound. With this observation in mind, we will review a theory of morphology offered by Lieber (1980),[19] since this theory allows us to offer a far more elegant version of SV than (13), which is simply an extended version of the rule proposed by Otsu.

Lieber (1980) offers a version of morphology which utilizes a permanent lexicon in which stems and affixes are listed. Lexical structure is defined by a context-free rewriting rule. This rule generates unlabeled tree structures; there are no specifications like stem or affix. Entries from the permanent lexicon are inserted into the terminal nodes of these structures.

A set of feature percolation conventions are responsible for the labeling of the tree structure. This is summarized as (26) below;[20]

(26) a. Convention I: All features of stem morpheme, including category features, percolate to the first non-branching node dominating that morpheme.

b. Convention II: All features of an affix morpheme, including category features, percolate to the first branching node dominating that morpheme.

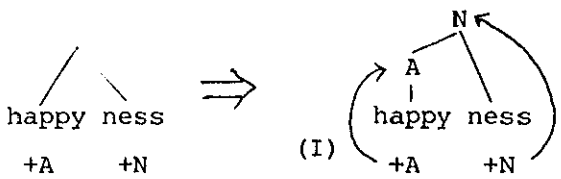
c. Convention III: If a branching node fails to obtain features by convention II, features from the next lowest labeled node are automatically percolated up to the unlabeled branching node.

d. Convention IV: In compound words features from the righthand stem are percolated up to the

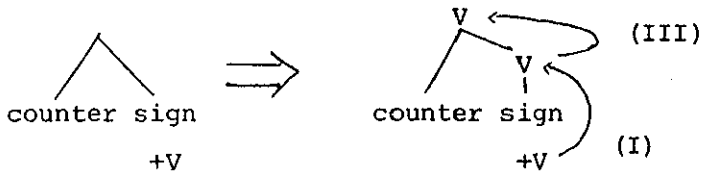
branching node dominating the stems.[21]

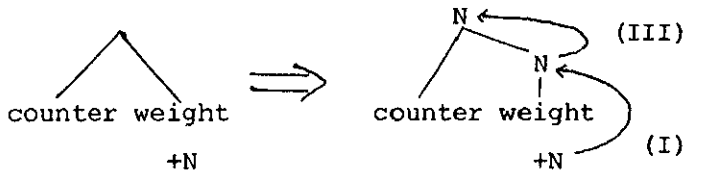
The following examples illustrate conventions I – IV at work.

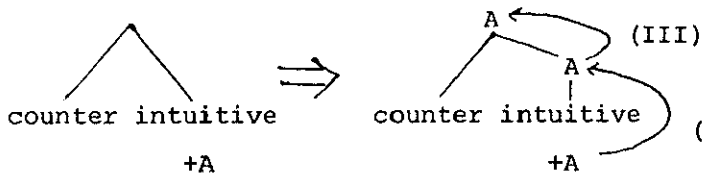
(27) a.



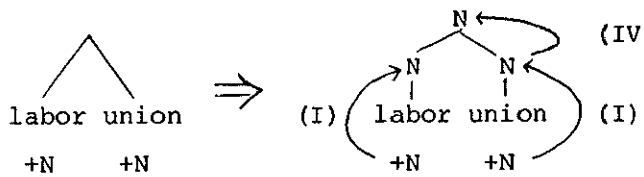
b.

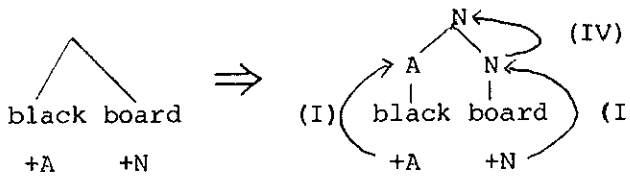






c.

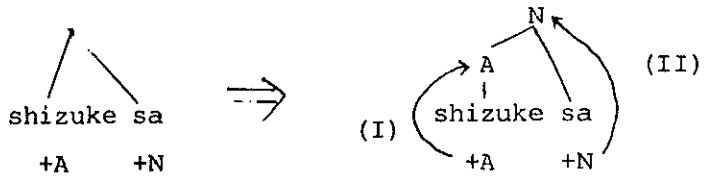




Now let us see how Lieber's theory of morphology works in cases of compounds and derivatives in Japanese. We assume that what Otsu calls "strict compounds" are actually not compounds.

Since their meanings are not compositional (e.g. karakami), each of them is provided with an independent lexical entry with its meaning. This will account for non-occurrence of SV in these cases. The following illustrate lexical structures of noun, adjectival, and verbal compounds and derivatives:

(28) a.



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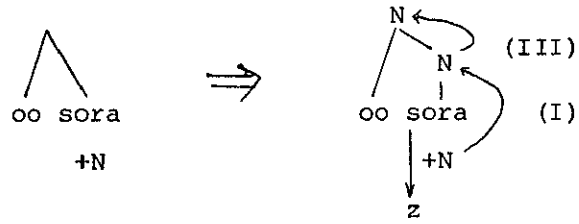
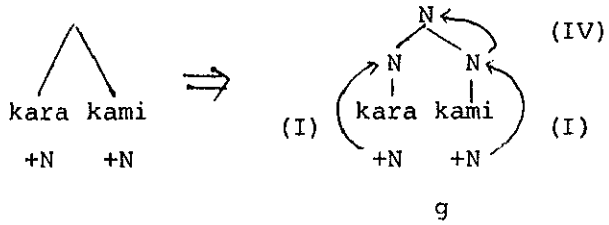


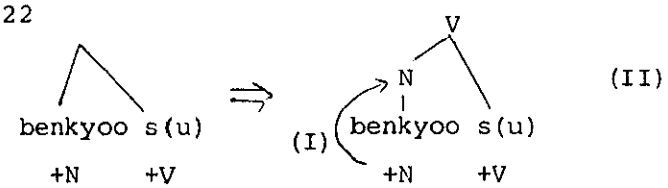
c.



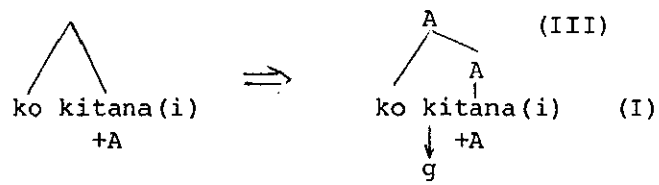
g

('Chinese paper')

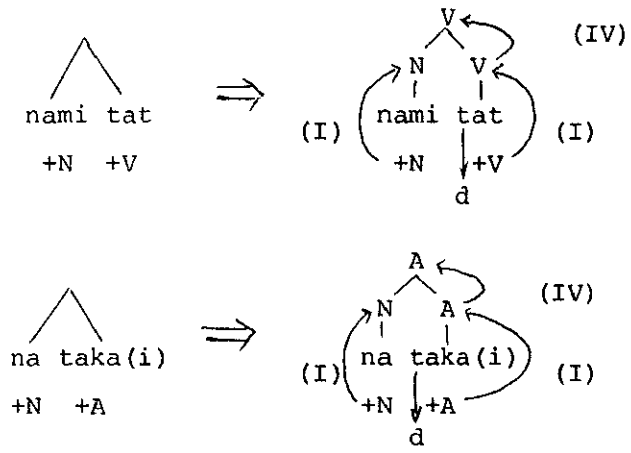
(29) a.[22]



b.



c.



We observe in (28) and (29) that SV takes place where the right node is labeled N, V, or A. Where the right node is not labeled, we find no SV taking place, as in (28a) and (29a). Let us call an element which is dominated by a labeled terminal node labeled member. We can then state SV as follows:

(30) Voice the first segment of a labeled righthand member.

Williams (1981: 248) says "In morphology, we define the head of a morphologically complex word to be the right h and member of that word" (the Righthand Head Rule). Following this definition, (30) can be paraphrased as (31), which is our final version of the rule SV:

(31) Voice the first segment of a labeled head of a complex word.

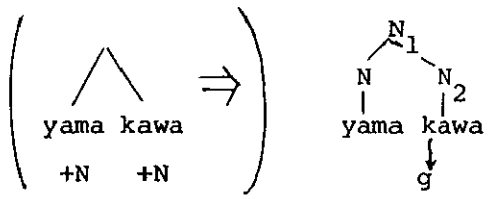
A "complex word" can be defined as the one whose lexical structure has one or more branching nodes. As noted in note 15, the effect of the rule is vacuous if the first segment in question is underlyingly voiced (i.e. a sonorant or a voiced obstruent).

5. Dvandva: A Possible Account

Having adopted a theory of morphology like Lieber's, the question arises as to how to treat cases of dvandva within our framework. Without a detailed study of the syntactic/morphological distinction between dvandva and what Otsu calls loose compound, it seems difficult to provide a definite answer. But I will give some possible account for the distinction between them.

Let us take yamakawa (dvandva) meaning 'mountains and rivers' and yamagawa (llose compound) meaning 'a mountain river'. The lexical structure of the latter can be represented as follows:

(32)

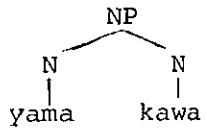


According to Williams' definition of the head of a complex word, N_2 is the head of N_1 and SV changes k in kawa to g. The claim that N_2 is the head of N_1 in no way contradicts our intuition given that yamagawa is anyway a kind of river. On the other hand, yamakawa (dvandva) does not simply mean a kind of river but mountains and rivers. Thus there is some doubt about the claim that kawa of yamakawa is the head of the whole word. If it is not the head, SV does not apply, as desired. However, if yamakawa had the same structure as yamagawa, namely (32), then we would have to say, contrary to our intuition, that kawa of yamakawa is the head, and there would be no reason why SV should not apply.

I suggest that yamakawa is not a single word, let alone a

compound, but simply a combination of two words whose syntactic structure would be something like the following:

(33)

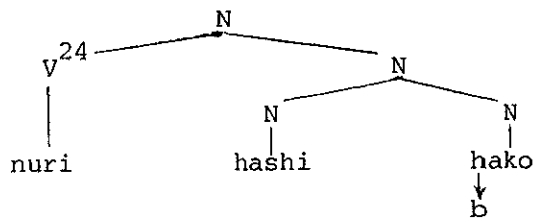


Unfortunately, I cannot give syntactic evidence for the claim that the phrasal category of yamakawa is different from that of yamagawa. (Otsu (1980) presents some evidence from the difference in accent.) Whatever the correct structure of yamakawa or dvandva in general may be, it is sufficient to assume that yamakawa is not a morphologically complex word. If so, kawa in yamakawa cannot be a head and hence SV (31) does not apply.[23]

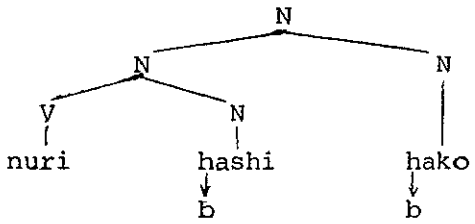
6. More Complex Cases

In this final section, we will consider more complex cases than we have seen thus far. There are a number of cases where complex words are further embedded to form more complex words, as illustrated by the following examples, taken from Otsu (1989):

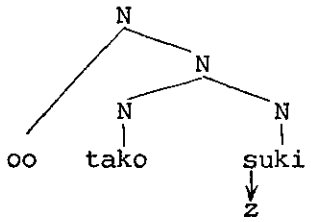
(34) a. nurihashibako ('chopstick box which is lacquered')



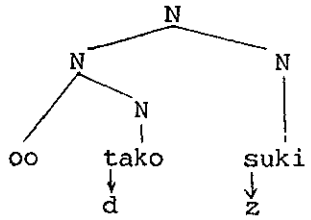
b. nuribashibako ('box for lacquered chopsticks')



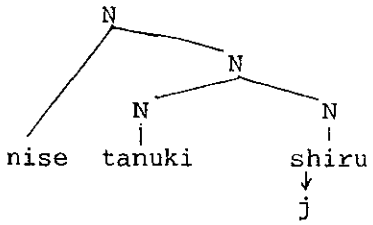
(35) a. ootakozuki ('great lover of octopi')



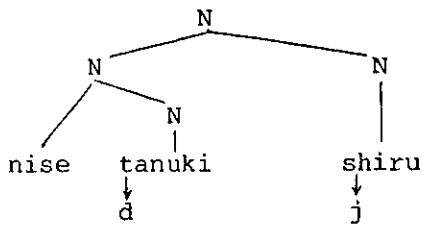
b. oodakozuki ('lover of big octopi')



(36) a. nisetanukijiru ('raccoon dog soup which is not authentic')

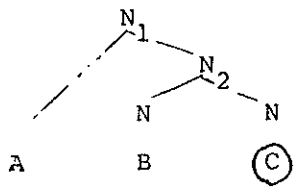


b. nisedanukijiru ('soup made from pseudo raccoon dog')

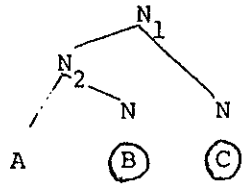


The above paradigm can be summarized as follows:

(37) a.



b.



Elements are circled whose first segment shows SV. To account for this paradigm, Otsu proposes the following condintion (38) on his rule (8), repeated here for convenience:

(8) C $\longrightarrow$ [+voiced] / $[_N$ [# _ Y

where (i) X≠null and

(ii) Y does not contain any voiced obstruents

(38) Rendaku applies only when a constituent containing a potential rendaku segment [i.e. a segment which would be voiced by SV--M.S.] c-commands X in (47) [=our (8)].

It now turns out that three conditions in total must be imposed on his rule: conditions (i) and (ii) in (8), and the third condition (38). However, none of such conditions would be required in our rule (31). Otsu's condition (i) follows trivially from the fact that SV stated as (31) applies only to complex words.

Condition (ii) is replaced by a more general filter version like (24) (as far as, of course, it is empirically correct). Condition (38) is also unnecessary for our rule (31). C in (37a) is a labeled head of N_2. Neither A nor B in (37a) is a labeled head of N_2 or N_1. On the other hand, in (37b), B is a labeled head of N_2, and C is a labeled head of N_1. Thus our rule predicts just the desired result, namely that the first segment of only the circled elements in (37) shows SV, without any further provisoes.[25]

NOTES

* This is a somewhat revised and reduced version of my unpublished paper "Notes on some phonological processes and Rendaku in Japanese" written in 1981. I would like to express my thanks to Shigeki Seki and Yukio Hirose for comments and suggestions on the present paper. All errors are my own.

[1] I will use "SV" to refer either to the phenomenon itself or to the rule responsible for it, since no ambiguity should arise given the right context.

[2] We will refer to compounds whose syntactic category is a noun as noun compounds and those whose syntactic category is a verb or an adjective as verbal or adjectival compounds, respectively.

[3] Examples a, c, d and e are taken from Otsu (1980).

[4] Otsu's distiction between loose and strict compounds is motivated in Allen (1975), who shows that these two types of compounds are found in Welsh.

[5] Recall that his concern is limitted to noun compounds. Thus he does not consider whether Japanese has, say, "verbal"

dvandva consisting of two V's. See section 2.

[6] # is a word boundary and +, a morpheme boundary. Otsu suggests that the latter boundary may not be necessary for strict compounds.

[7] Otsu suggests that the boundary between an affix and a stem may be + rather than #, or there may not be any boundaries.

[8] Some of the data below are taken from Nagashima (1980).

[9] Although ao, like naga and waka, seems to be a (stem of) adjective, it can function syntactically as a noun when used in isolation, as in boku-wa ao-ga suki-da. The categorial status of saki is less clear. Like ao, it may be used syntactically as a noun, as in saki-ga omoiyarareru, but its semantic function is more adverbial-like (i.e. directional) and it may be just an affix when used in compounds. Since in our discussion there is no use in dwelling upon the issue, I will leave it open. It suffieces to note that all of the first elements of these verbal compounds cannot be considered to be verbs in one form or another. We will turn to verbal compounds whose first element is plausibly a verb later.

[10] Ru in suru is a present-tense marker and therefore should be considered to be an independent morpheme. Cf. sir+ru → siru ('know'), sir+ta → sitta ('knew'). Note also that u in su(+ru) mutates, as in suru ('do') and sita ('did'). We assume that words like uttorisuru, which is of the form X-su(ru), X-su(ru), is analyzed as [uttori·s(u)]+Tense.

[11] We assume that verbs like sakinzuru, karonzuru, etc., are of a different type from X-su(ru). Voiced sound [z] might be the result of the effect of the preceding nasal consonant, rather than SV. In any case, they are, I believe, frozen forms

and perhaps should be given independent lexical entries.

[12] Specification of the righthand member of V may be redundant, since any consonant must be followed by a vowel in Japanese.

[13] s becomes š before i by an independent rule.

[14] Note that in Japanese, b is considered a voiced counterpart of h as well as p.

[15] In fact, we can state SV in such a way as to voice any first segment of the second element of compounds. If the first segment is underlyingly a voiced one, the effect of SV would be null.

[16] The scope of (24) is obviously wider than this. Whether or not SV has applied, any morpheme whose phonetic output contains more than one voiced obstruent is excluded by (24). An interesting prediction follows from the effect of (24). Some Japanese, especially young, speakers do not seem to make obligatory use of (22). The prediction is that even for such speakers the pronunciation of nawabashigo would be [nawabašiŋo] rather than [nawabašigo].

[17] Yukio Hirose has pointed out to me that the word dobu ('ditch') may be an exception, since it consists of a single morpheme and contains two obstruents. Note also that we have dobun, an onomatopoetic expression, which seems to be related to dobu. As Hirose notes, there are many onomatopoetic expressions which contain more than two obstruents, such as gaburi as in gaburi-to nomikomu (cf. gabunomi), doba, as in (hanaji-ga) dobatto deru, zudon, as in zudon-to ochiru, etc. I am not quite sure whether these are considered real counterexamples to (24) or they exceptionally contain more than one obstruent for

some reason. It seems to me that this exceptional character of the expressions in question is a factor which makes them really onomatopoeia-like.

[18] With regard to the following example,

(i) juzu+tsunagi

many speakers of Japanese (including myself) seem to accept both juzutsunagi and juzuzunagi, but prefer the former. Since g is actually pronounced [ŋ], the latter should be equally acceptable. Preference of the former to the latter seems to be due to the tendency to avoid the sequence of identical syllables. Note that SV takes place in the following example:

(ii) juzu+tama ⟶ juzudama

[19] See Farmer (1980: 52-58) for a useful summary of Lieber's theory, to which I owe the following brief review a lot.

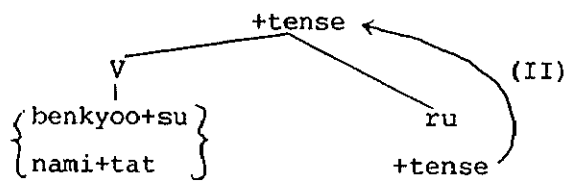
[20] Lieber has eliminated word formation rules such as those proposed by Halle (1973), Aronoff (1976), Siegel (1974) and Allen (1978). This is made possible, as Farmer (1980: 57-58) notes, by the following assumptions: (i) affixes, as well as stems, are listed in the lexicon (ii) affixes have subcategorization frames, which define frames into which affixes are inserted (like syntactic strict subcategorization) (iii) a context-free rewriting rule in concert with the feature percolation conventions defines lexical structures.

[21] Conventions I – III are claimed to be language universal principles of word formation. Convention IV is language particular. We will assume, however, that this convention is applicable to Japanese as well.

[22] Since s(u) in (29a) is a verbal suffix (cf. section 2), its feature [+V] is percolated up to the first branching node

dominating s(u), by Convention II in (26b). In contrast, since tat is a stem which functions independently as a verb, its feature is, by Convention I, percolated to the first non-branching node dominating tat, as in (29c). Recall that stems and affixes are listed in the lexicon. With a tense-marker such as ru attached to benkyoo+s(u) or nami+tat, the whole lexical structure would be something like the following, where ru (or tense-marker in general) is considered to be a (bound) suffix:

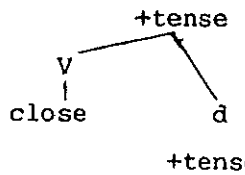
(i)



(tat+ru → tatu)

This structure follows Williams' (1981) feature percolation conventions, which are similar to those of Lieber's. He posits the following lexical tree for closed:

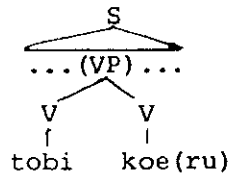
(ii)



As for (29b,c), i in adjectives kitanai and takai is parenthesized because this i may well be considered to be a tense-marker, like ru attached to verbs. Note that adjectives as well as verbs show conjugation, as in takai vs. takakatta.

[23] This approach may provide a way to account for non-occurrence of SV in such words as tobikoe(ru), discussed in section 2. Suppose tobikoe(ru) is not a compound but simply a combination of verbs, as in the following. (Whether the VP-node is well-motivated in Japanese is not relevant here.)

(i)



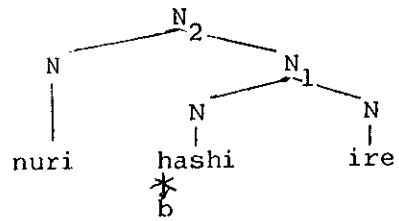
Since koe(ru) is not the head of a complex word under this analysis, SV does not apply. Note that the lack of tense-marker in the first verb tobi will not pose a problem. Such a case is typical of Japaneae, as shown by the following example, where only the last verb carries a tense-marker.

(ii) Taroo-wa hon-o yomi, kaki, shuppanshita.

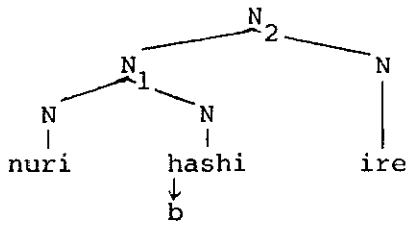
[24] Otsu gives nuri the category N, rather than V. The exact categorial status of such an element need not concern us, however.

[25] As Otsu points out, cyclical application of (8), with a condition (ii), cannot account for all the data. It would seem at first that application of (8) on the N_2 cycle in (37a) blocks its further application on the N_1 cycle which would change the first segment of B to [+voiced], since on this cycle Y in (8) contains a voiced obstruent, namely the one which has been created by the application of (8) on the N_2 cycle. (This is not the case with (37b), since (8) applies first on the N_2 cycle and then on the N_1 cycle.) This account is falsified by the following, taken from Otsu (1980):

(i) nurihashiire ('chapstick case which is lacquered')



(ii) nuribashiire ('case for lacquered chopstickes')



(ii) poses no problem. In (i), however, there is no reason why (8) should not apply on the N_2 cycle under this account, since the Y-part in (8) does not contain any voiced obstruent.

In our framework, non-occurrence of SV in B in (37a) has nothing to do with the presence of a voiced obstruent in C created by the rule. Since B and C are distinct morphological elements, our filter-version of Lyman's Law (24) is irrelevant here.

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